Rocky Mountain Remediation Services, L.L.C.
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RF/RMRS-97-023

Soil Sampling and Analysis Plan to Characterize Individual Hazardous Substance Sites (IHSSs) 121 and 148 at Building 123

Rocky Flats Environmental Technology Site

Prepared by

Rocky Mountain Remediation Services, L. L. C.

November 1997

DATE November 18 ,1997		
TO DISTRIBUTION	DEPT.	BLDG.
FROM KIRK HILBELINK	DEPT. RMRS-E/C/D&D	BLDG. T130F
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ROCKY FLATS PLANT

MEMORANDA

"SAY IT IN WRITING"

Attached for your review is the Soil Sampling and Analysis Plan to Characterize IHSS 121 and 148 at Building 123. Please provide comments to Kirk K. Hilbelink (x6232, Fax 8244) no later than **COB Friday, November 21, 1997.** Comment resolution discussions can be coordinated on an individual basis, if necessary. If there are no significant changes to the document, signatures (where applicable) will be requested at that time. Please contact me if you have questions concerning the attached.

cc:
C. Guthrie
G. Konwinski
J. Massey
J. Miller
G. Sollner

Kirk K. Hilbelink
SIGNATURE

RF-34700 (7/84)

SOIL SAMPLING AND ANALYSIS PLAN TO CHARACTERIZE INDIVIDUAL HAZARDOUS SUBSTANCE SITES (IHSSs) 121 AND 148 AT BUILDING 123

NOVEMBER 1997

This Sampling and Analysis Plan has been reviewed and approved by:

John Miller, Radiological Engineering	Date
Gary Konwinski, Environmental Management	Date
Jack Massie, RMRS Quality Assurance	Date
Greg Sollner, K-H Compliance and Performance Assurance	Date
C.L. Guthrie, RMRS Project Management	Date

This Sampling and Analysis Plan was prepared by:

Kirk K. Hilbelink, Project Scientist	Date

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ACRONYMS

ALARA ..... as low as reasonably achievable
Am .... americium
Be .... beryllium
BRCS ..... Building Radiation Cleanup Standard
BTEX ...... benzene, toluene, ethylbenzene, and xylenes
$C_2H_4O_2$ .... acetic acid
CDPHE .... Colorado Department of Public Health and the Environment
CERCLA ... Comprehensive Environmental Response, Compensation, and Liability Act
Cm .... curium
DQO ...... Data Quality Objective
DOE ...... U.S. Department of Energy
EMD .... Environmental Management Department
EPA .... U.S. Environmental Protection Agency
ER .... Environmental Restoration
FID .... Flame Ionization Detector
FO .... Field Operations
GIS .... Geographical Information System
GPS .... Global Positioning System
HNO_3 ...... nitric acid
HCl .... hydrochloric acid
$HClO_4$ ..... perchloric acid
HF .... hydrofluoric acid
HPGe ...... high-purity germanium
H_2SO_4 ..... sulfuric acid
IHSS ...... Individual Hazardous Substance Site
NaOH ..... sodium hydroxide
NH_4OH .... ammonium hydroxide
OPWL ..... Original Process Waste Line
OU .... Operable Unit
PAC .... Potential Area of Contamination
PAM .... Proposed Action Memorandum
PARCC .... precision, accuracy, representativeness, completeness, and comparability
PCB .... polychlorinated biphenyl
PCE .... tetrachloroethene
PID .... Photo Ionization Detector
Pu .... plutonium
QA/QC .... Quality Assurance/Quality Control
QAPD ..... Quality Assurance Program Description
RCRA ..... Resource Conservation and Recovery Act
RCT .... Radiological Control Technician
RFCA ...... Rocky Flats Cleanup Agreement
RFEDS .... Rocky Flats Database System
RFETS ..... Rocky Flats Environmental Technology Site
RFI/RI ..... RCRA Facility Investigation/Remedial Investigation
RMRS ..... Rocky Mountain Remediation Services
SOPs ..... Standard Operating Procedures
SAP .... Sampling and Analysis Plan
TAL .... Target Analyte List

ACRONYMS (Cont)

TCFM ..... trichlorofluoromethane
TCL .... Target Compound List
TOC ...... total organic carbon
U .... uranium
UBC ...... under building contamination
VOC ...... volatile organic compound

LIST OF APPLICABLE STANDARD OPERATING PROCEDURES (SOPs)

Identification Number	Procedure Title
2-G18-ER-ADM-17.01	*Records Capture and Transmittal*
2-G32-ER-ADM-08.02	*Evaluation of ERM Data for Usability in Final Reports*
2-S47-ER-ADM-05.15	*Use of Field Logbooks and Forms*
5-21000-OPS-FO.03	*General Equipment Decontamination, Section 5.3.1, Cleaning Steel or Metal Sampling Equipment Without Steam in the Field*
5-21000-OPS-FO.06	*Handling of Personal Protective Equipment*
5-21000-OPS-FO.10	*Receiving, Labeling, and Handling Environmental Containers*
5-21000-OPS-FO.13	*Containerization, Preserving, Handling and Shipping of Soil and Water Samples*
5-21000-OPS-FO.15	*Photoionization Detectors and Flame Ionization Detectors*
5-21000-ER-OPS-GT.01	*Logging Alluvial and Bedrock Material*
5-21000-ER-OPS-GT.39	*Push Subsurface Soil Sampling*
4-U50-REP-1006	*Radiological Characterization of Bulk or Volume Materials*

SOIL SAMPLING AND ANALYSIS PLAN TO CHARACTERIZE INDIVIDUAL HAZARDOUS SUBSTANCE SITES (IHSSs) 121 AND 148 AT BUILDING 123

1.0 INTRODUCTION

1.1 Purpose

The purpose of this document is to provide a Sampling and Analysis Plan (SAP) for the characterization of soils underlying and surrounding Building 123, with respect to the Rocky Flats Cleanup Agreement (RFCA) and pursuant to the Resource Conservation and Recovery Act (RCRA) and Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA). The goal of the field investigation is to provide the data necessary to support the decontamination and demolition of Building 123 and fulfill criteria defined by the *Proposed Action Memorandum (PAM) for the Decommissioning of Building 123* (RMRS 1997a).

The objective of the SAP is to define specific data needs, sampling and analysis requirements, data handling procedures, and associated Quality Assurance/Quality Control (QA/QC) requirements for this project. All work will be performed in accordance with the RMRS Quality Assurance Program Description (QAPD) (RMRS 1997b).

1.2 Background

Building 123 is located on Central Avenue between Third and Fourth Streets at the Rocky Flats Environmental Technology Site (RFETS, Figure 1.1). The Building 123 Area encompasses overlapping Individual Hazardous Substance Sites (IHSSs) 121 and 148 and a portion of RCRA Unit 40 (Figure 1.2).

Four (4) associated Potential Areas of Contamination (PACs), 100-601, 100-602, 100-603, and 100-611 have been identified in the RFETS *Historical Release Report* (HRR, DOE 1992c). The PACs were established as the result of documented spill incidents.

Unconfirmed reports of contaminant spills have been indicated in interviews with building employees. In the late 1960's or early 1970's a cesium-contaminated liquid was spilled on the concrete floor in Room 109C (Figure 1.2). The floor was immediately sealed to immobilize the contamination. No further action was initiated to address consequences of the spill.

1.2.1 Individual Hazardous Substance Site (IHSS) 121

IHSS 121 consists of RCRA Unit 40 underground Original Process Waste Lines (OPWLs) P-1, P-2, and P-3, which were designated in the *Final Phase I RCRA Facility Investigation/Remedial Investigation (RFI/RI) Work Plan For Operable Unit 9* (DOE 1992a). The area has also been identified as PAC 000-121 in the HRR. The OPWL system constitutes former Operable Unit No.9 (OU 9) and RCRA Unit 40, the plant-wide process waste system comprised of tank and underground pipelines constructed to transport and temporarily store process wastes from point of origin to on-site treatment and discharge points.

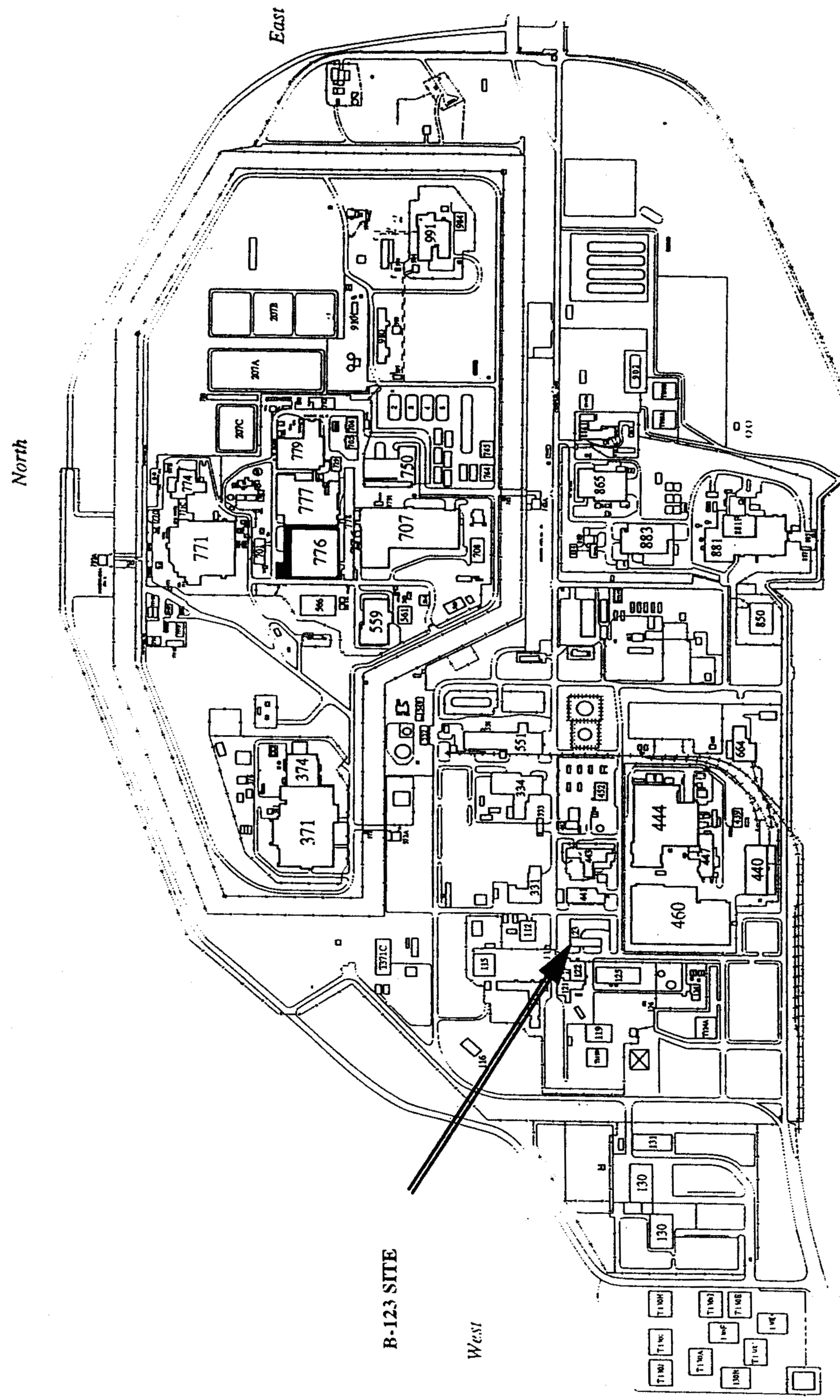

Figure 1.1 Building 123 Site Location

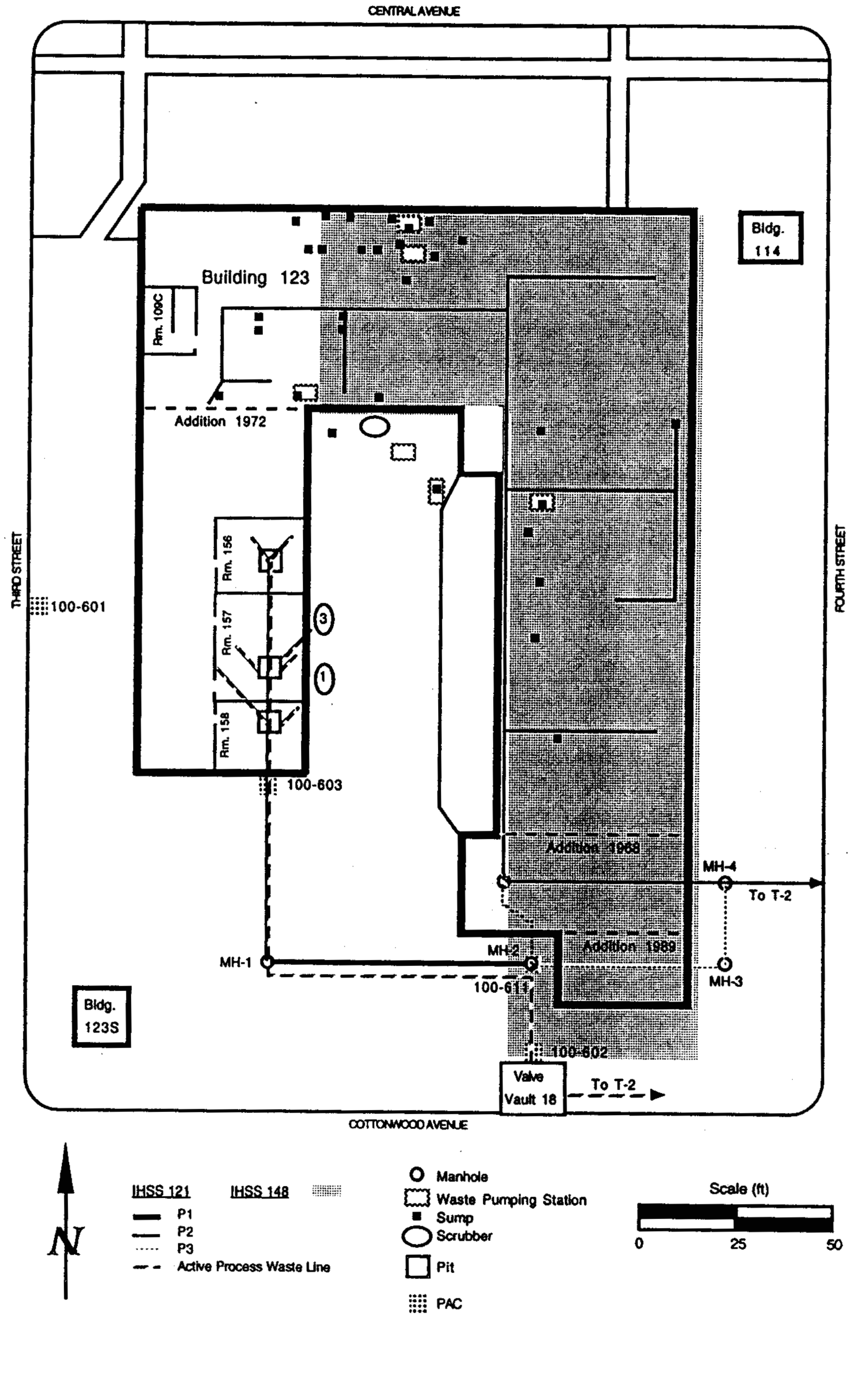

Figure 1.2 Location of Building 123 and Associated IHSSs 121 and 148

All process waste generated from 1952 to 1968 was transferred from Building 123 to Building 441 through line P-2, which ran below the west side of the east wing before exiting at the southeast corner of the building. In 1968 the east wing was extended about fifty (50) feet to the south. Prior to the building addition, two manholes (MH-2 and MH-3, Figure 1.2) were constructed and the line was extended south to MH-2, then east to MH-3, and north to MH-4, before assuming the original path at P-2. The extension was designated as P-3. One manhole was abandoned and covered by the building addition. In 1972 a west wing was constructed, extending south from the northwest corner of the original building. Prior to construction of the wing, line P-1 was installed to transfer waste to manhole MH-1, then east to a junction with P-3 at MH-2 (Figure 1.2). The lines transferred the following process waste from Building 123:

- Acids: nitric acid (HNO_3), hydrofluoric acid (HF), sulfuric acid (H_2SO_4), hydrochloric acid (HCl), acetic acid ($C_2H_4O_2$), and perchloric acid ($HClO_4$);
- Bases: ammonium hydroxide (NH_4OH) and sodium hydroxide (NaOH);
- Solvents: acetone, alcohols, cyclohexane, toluene, xylenes, triisooctomine, and ether;
- Radionuclides: various isotopes of plutonium (Pu), americium (Am), uranium (U), and curium (Cm);
- Metals: beryllium (Be) (trace amounts); and
- Others: ammonium thiocyanate, ethylene glycol, and possible trace amounts of polychlorinated biphenyls (PCBs) (DOE 1992a).

In 1982 P-2 and P-3 were abandoned and plugged with cement. In 1989 the process waste transfer system was upgraded, including removal of the east-west section of P-1 between MH-2 and MH-3. The north-south section of P-1 between Building 123 and MH-1 was converted to the new process system. Three large, interconnected concrete sump pit areas were installed in Rooms 156, 157, and 158 to accommodate process waste system backup. Pipe was installed connecting MH-1 to Valve Vault 18. A second building addition was also made to the south end of the east wing, partially overlying line P-3 (Figure 1.2).

Currently, all process waste throughout Building 123 is collected in floor sumps. Each sump collects and temporarily stores liquid waste which is then pumped through overhead lines into a main floor sump in Room 158. The waste is then gravity-fed through P-1 to Valve Vault 18, then to underground Tank T-2 (Tank 428) at Building 441, and finally to Building 374 for treatment (Figure 1.2).

1.2.2 Individual Hazardous Substance Site (IHSS) 148

A detailed characterization of former Operable Unit No. 13 (OU 13) was conducted from September 1993 to February 1995 as part of a Phase I RCRA RFI/RI. The characterization included high-purity germanium (HPGe) surveys, vertical soil profiles, surface soil sampling and soil gas surveys. The investigation identified an area of reported small spills of nitrate-bearing wastes along the east side of Building 123 and a potential for soil contamination beneath the building due to possible leaks in OPWL P-2. The area was established as IHSS 148 and detailed in the *Final Phase I RFI/RI Work Plan for Operable Unit 13* (DOE 1992b). The area has also been identified as Under Building Contamination (UBC) 123 and PAC 100-148 in the HRR.

Thirty-four (34) analytes were detected in the surface soil survey, including twenty-six (26) inorganic compounds and eight (8) radionuclides. Eleven (11) analytes exceeded background limits at a minimum of one sample location throughout IHSS 148. Constituents that exceeded minimum detection levels or activities are indicated in Table 1.2.

Table 1.2 Constituents Detected above Minimum Detection Levels or Activities in Soil Samples Collected during Surface Soil Survey at IHSS 148

Constituents Detected Above Minimum Detection Levels or Activities	Maximum Concentration	Background Limits[a]	Tier II Soil Action Levels[b]
Chromium	95.6 mg/kg [c]	24.9 mg/kg [c]	4860 mg/kg [d]
Cobalt	28.7 mg/kg	24.8 mg/kg	123,000 mg/kg
Copper	43.4 mg/kg	27.3 mg/kg	81,800 mg/kg
Lead	165 mg kg	61.4 mg/kg	NA[e]
Nickel	52.4 mg/kg	26.8 mg/kg	40,900 mg/kg
Strontium	94.7 mg/kg	90.1 mg/kg	>1,000,000 mg/kg
Zinc	1,220 mg/kg	86.6 mg/kg	>1,000,000 mg/kg
Americium-241	0.197 ± 0.032 pCi/g	0.0227 pCi/g	38 pCi/g
Plutonium-239/-240	0.169 ± 0.04 pCi/g	0.066 pCi/g	252 pCi/g
Uranium-233/-234	2.04 ± 0.396 pCi/g	2.253 pCi/g	307 pCi/g
Uranium-238	2.14 ± 0.309 pCi/g	2.00 pCi/g	103 pCi/g

a Source: DOE 1995, *Geochemical Characterization of Background Surface Soils: Background Soils Characterization Program,* May.
b Source: DOE 1996, *Final Rocky Flats Cleanup Agreement*, July. Metal analyte action levels are based on office worker exposure to soil; radionuclide action levels are based on annual dose limits.
c Result indicates total chromium (chromium III + chromium VI).
d Result indicates chromium VI only. Action level for chromium III is <1,000,000 mg/kg.
e Constituent does not have an established action level.

The soil-gas survey was conducted on a 25-foot grid in accordance with the work plan. Sixty-four (64) soil-gas locations were sampled during the survey. Thirteen (13) samples contained volatile organic compound (VOC) levels in excess of the 1 µg/ L method detection limit. Benzene, toluene, ethylbenzene, and xylene (BTEX) fuel constituents were detected in samples collected from the perimeter of Building 123 and within the west and east wings of the building. Trichlorofluoromethane (TCFM) was detected in nine samples distributed throughout the IHSS 148 area at levels up to 2.6 µg/ L. Tetrachloroethene (PCE) was detected at 1.5 µg/ L in a sample collected to the east of Building 123. The presence of organic extraction constituents is consistent with unconfirmed reports that such liquids used in radionuclide analyses were occasionally disposed onto the soil surface outside of Building 123 and allowed to evaporate. Analyses results indicate that subsurface infiltration precluded full evaporation.

1.2.3 Resource Conservation and Recovery Act (RCRA) Unit 40

The Building 123 area encompasses a portion of RCRA Unit 40, which includes all active overhead and underground and process waste lines in and around Building 123. No other RCRA unit exists within the Building 123 area. A plan for partial closure of RCRA Unit 40 will be written to characterize and manage all active OPWLs associated with Building 123, as all abandoned lines were properly decommissioned prior to implementation of RCRA regulations.

1.2.4 Potential Areas of Contamination (PACs)

Potential Areas of Contamination (PACs)100-601, 100-602, 100-603, and 100-611 were identified in the HRR, and involve potential impact to the soils surrounding Building 123. All of the four (4) PACs are located in Figure 1.2. The following outlines the nature of each PAC by describing the occurrence, constituents released, and response to the occurrence.

1.2.4.1 PAC 100-601, Phosphoric Acid Spill

On April 13, 1989, two five-gallon plastic containers of phosphoric acid, which were among other containers of waste chemicals awaiting disposal in a storage cabinet outside of Building 123, deteriorated and leaked a portion of the contents onto the paved ground surface. Approximately one gallon of 1,2 ethylhexyl phosphoric acid leaked from the containers. At the time the release was detected, approximately eight ounces of the liquid were present on the ground within the vicinity of the cabinet. The spill was contained and the remaining liquid was properly disposed. No further action was required to address consequences of the spill.

1.2.4.2 PAC 100-602, Process Waste Line Break

On April 13, 1989, Valve Vault 17, located on Cottonwood Avenue between Building 443 and 444, was found to be flooded with approximately 1,200 gallons of aqueous waste. Subsequent investigation indicated that the source of the waste was a break in the active portion of P-1 in manhole MH-1 (Figure 1.2). Leakage from the break had migrated into bedding material surrounding the pipe and ultimately reached Valve Vault 17 through either pipe bedding materials (i.e. soils) or a PVC electrical conduit. The release also migrated into a section of the OPWL network. Discharge of Building 123 process waste into the broken line was discontinued on April 18, 1989, five days after the initial detection of release at Valve Vault 17. The potentially affected area includes the active process waste line between MH-2 and Valve Vault 18; the process waste line between Valve Vault 18 and Valve Vault 17, soils surrounding Valve Vault 18 and Valve Vault 17, and OPWL P-3 between MH-2 and MH-3. In July 1989, groundwater containing blue dye used several months earlier to trace the release was observed seeping into excavations around Valve Vault 18.

The release consisted of Building 123 process waste. An estimate was made of types and quantities of materials released to the environment during the five-day period between detection of the release and diversion of Building 123 wastes from the broken line. The estimate was based on typical daily quantities of wastes discharged from Building 123.

- 25 gallons urine;
- 12.5 gallons nitric acid (concentration unknown);
- 20 gallons hydrochloric acid (concentration unknown);
- 1.5 lbs ammonium thiocyanate;
- 1.0 lbs ammonium iodide; and
- 2.5 lbs ammonium hydroxide (concentration unknown).

The above wastes would have been diluted in approximately 2,000 gallons of tap water.

Minor amounts of naturally-occurring uranium were detected in soil and water samples collected after the release. Alpha activity up to 140 pCi/L was recorded in samples of the waste from Valve Vault 17. One water sample from MH-2 also contained eight percent ethylene glycol. Soil sampling was conducted to determine the source and extent of the release (See Section 1.2.2). A temporary surface line was installed, and a replacement underground line was installed in 1989 as part of the process line upgrades. Since the affected areas were located near existing IHSSs scheduled for investigation and remediation activities, no cleanup was initiated. Water and soil samples collected for several weeks after the release indicated that contamination levels (nitrates, chlorides and pH) decreased steadily after the broken line was bypassed.

1.2.4.3 PAC 100-603, Bioassay Waste Spill

On June 9, 1989, OPWL P-1 was under excavation and replacement due to a break in the line (PAC 100-602). The excavated end of the broken line as temporarily capped with a plastic bag, and Building 123 process waste was rerouted to bypass the broken line. A pump used to reroute the waste failed and allowed the waste to overflow into the broken line. A portion of the waste leaked around the plastic bag and into the excavation. The release was confined to the excavation.

The release consisted of bioassay waste containing hydrochloric acid and nitric acid. The waste exhibited a pH of approximately 1. The waste may also have contained urine, and up to a combined total of 1.5 gallons of ammonium thiocyanate, ammonium iodide and ammonium hydroxide. The estimated maximum volume of the spill was 30 gallons. The released material commingled with rainwater in the excavation.

Potential flow from the excavation was contained with earthen berms. Approximately 100 gallons of rainwater contaminated by the spill were neutralized, pumped from the excavation, and transferred to the process system for treatment in Building 374. Samples were collected to evaluate the spread of contamination. Results indicated that contamination was restricted to the excavation within eight feet of Building 123. No further action has been initiated.

1.2.4.4 PAC 100-611, Building 123 Scrubber Solution Spill

On November 7, 1989 an inoperative pump in the Building 123 process waste transfer system caused the Building 123 Scrubbers 1 and 3 to overflow, spill scrubbing solution into a bermed area outside of the building and into three sump pits in Rooms 156, 157, and 158 (Figure 1.2). All of the spilled solution was contained within secondary containment structures, and none of the solution was believed to have impacted the environment. The pits were pumped out and the concrete liners properly sealed. The transfer pump failure was determined to be the result of blockage caused by glass filtering wool.

The scrubbing solution consisted primarily of water and was used to scrub acids and salts used in Building 123. Approximately 50 gallons were released to the bermed area, and several hundred gallons were contained in the three sump pits. Analysis indicated that the solution contained in the bermed area exhibited a pH of 1.6; the solution in the three pits indicated a pH of 6.0. All spilled materials were contained and transferred into the Building 123 process waste transfer for eventual treatment at Building 374.

1.3 Geology

The local geologic setting includes an industrial area that has been gradually developed. The natural soils have been disturbed and replaced by fill during installation of the OPWLs and covered by pavement and structures including Building 123. The soils, fill, pavement, and structures are underlain by Rocky Flats Alluvium which averages about 38 feet in thickness and is composed of poorly- to moderately-sorted clay, silt, sand, and gravel. The Cretaceous Arapahoe Formation underlies the surficial material and is mainly claystone and silty claystone with sandstone bodies present. Groundwater exists below the site at a depth of approximately 12-17 feet and flows in a generally eastward direction.

2.0 SAMPLING RATIONALE

Historical information detailed in Section 1.2 provides general indications of the types of compounds anticipated at each IHSS, and was used to develop a systematic sampling strategy for this investigation. The sampling rationale is based on a combination of historical data and recommendations by K-H Statistical Applications (memo attached). Preliminary sampling will be restricted to soils underlying and surrounding Building 123.

The following conditions were considered in the development of the sampling strategy:

- the operating history of Building 123 suggests that contaminants may have been released into the environment;
- the physical and chemical properties of the contaminants suggest a chronic presence if released into the environment; and
- historical data indicate the presence of contaminants in quantities above the maximum background concentrations defined by Procedure 4-U50-REP-1006 *Radiological Characterization of Bulk or Volume Materials* and the *Background Geochemical Characterization Report* (DOE 1993).

The conceptual models of contaminant migration involve percolation downward through the vadose zone (generally less than 10 feet thick) to the water table and then in the direction of groundwater flow. Contaminants may volatilize, biodegrade, or radioactively decay before reaching the shallowest groundwater zone. Contaminant concentrations are also reduced by dispersion during migration through the porous Rocky Flats Alluvium. Paved portions of the Building 123 area provide an additional impedence to contaminant migration, as precipitation is diverted to the storm water drainage system instead of percolating through the ground surface.

Selection of contaminants of concern was based upon historical process data and analytical data.

3.0 DATA QUALITY OBJECTIVES (DQOs)

EPA has established a process to direct Superfund decision-making as the basis for developing DQOs. DQOs are designed to ensure that the type, quantity, and quality of environmental data used in decision making are appropriate for the intended application. The data must also facilitate appropriate remedial measures for mitigating risk. Data requirements to support this project were developed and are implemented in the project using criteria established in *Guidance for the Data Quality Objective Process*, QA/G-4 (EPA 1994).

The DQO process contains seven sequential steps which are rationalized below.

1. State the Problem

The problem is the uncertainty of the presence or absence of hazardous and/or radioactive constituents in soil beneath and surrounding Building 123. The purpose of the SAP is to collect field data to identify and delineate the extent of any subsurface contamination to support potential remedial actions.

2. Identify the Decision

The decision is to specify acceptable levels of decision errors that will be used as the basis for establishing the quantity and quality of data needed to support the proper remediation of IHSSs 121 and 148.

3. Identify the Inputs to the Decision

The following information will be required to resolve the decision:

- Historical Information
- Media Sampling (as outlined in Section 4.0)

4. Define the Study Boundaries

The methodology contained in this document applies to all buildings and areas associated with the Building 123 cluster.

5. Develop a Decision Rule

Data collected during this project will be evaluated in accordance with all applicable regulatory requirements. Exceedances of soil action levels will be evaluated for possible remedial action.

6. Specify Tolerable Limits on Decision Errors

The error rates for data collected during this study are incorporated into the detection limits for the analysis parameters. Thus, such limits have been determined to be acceptable for the DQOs.

7. Optimize the Design

The data collection design will be optimized by utilizing Characterization Instructions and Decommissioning Characterization Protocols, which will be developed for this project in accordance with the guidelines in the *Multi-Agency Radiological Site Survey and Site Investigations Manual* (MARSSIM) and the draft NRC NUREG/CR-5849, *Manual for Conducting Radiological Surveys in Support of License Termination.*

Data will be analyzed and compared to surface and subsurface soil action levels specified in RFCA. Evaluation of sample analyses may warrant a source removal action or separate groundwater investigation. If required, the data will also be the basis for corrective measure design.

4.0 SAMPLING ACTIVITIES

4.1 Sample Location and Frequency

The sampling event will focus on the soils underlying and surrounding Building 123 as indicated in Figure 4.1. Subsurface soils will be sampled to a total depth of six (6) feet as described in Section 4.3., as historical data indicates that the presence of contaminants below this depth is unlikely (DOE 1992b). However, evaluation of sample analyses results may indicate a potential for groundwater contamination.

Fifty (50) locations will be sampled: six (6) will be collected immediately beneath the building slab at a depth of approximately one foot; twenty (20) will be located underneath the building slab at a depth of approximately six feet; and twenty-six (24) will be located in areas surrounding Building 123 (Figure 4.1). The total includes four (4) samples to be collected from areas excavated to facilitate isolation of water line utilities. Locations were determined with respect to underground OPWLs, paved and unpaved areas, and recommendations by K-H Statistical Applications. The investigation will focus on the following areas:

- unpaved areas along the east side of Building 123, to further characterize potential areas of volatile organic constituent contamination;
- underground OPWLs beneath and to the south of Building 123;
- points at which the overhead waste process lines enter the subsurface at the south end of the west wing of Building 123;
- areas of reported surface spills within Building 123, including Room 109C (See Figures 1.2 and 4.1) and Potential Areas of Contamination (PACs);
- locations of process waste sumps, waste pumping stations, and OPWL junctions and elbows;
- areas that will be excavated to isolate the water line utilities; and
- a sampling grid at approximately 50-foot intervals to characterize the remainder of the Building 123 area. According to *Final Phase I RFI/RI Work Plan for Operable Unit 13, 100 Area* (DOE 1992) and personnel interviews, no contaminant spills or leaks have been reported in these areas, thus a uniform sampling grid is appropriate.

One soil sample will be collected at each location, which will be a composite of the entire core. Figure 4.1 indicates total depths of each core. Locations outside of Building 123 will be sampled to a total depth of six (6) feet. Locations within the Building 123 perimeter near waste pumping stations, sumps, and junctions will also be sampled to a depth of six (6) feet, as building as-built drawings indicate that the pipelines exist at a maximum depth of five (5) feet, and leaks associated with underground lines characteristically migrate downward. All remaining locations will be sampled immediately beneath the building slab (approximately one foot below slab surface) in areas near sumps and sites of historical spills to address potential migration of the process wastes through concrete.

A separate SAP will be prepared to address concrete sampling from within the building slab.

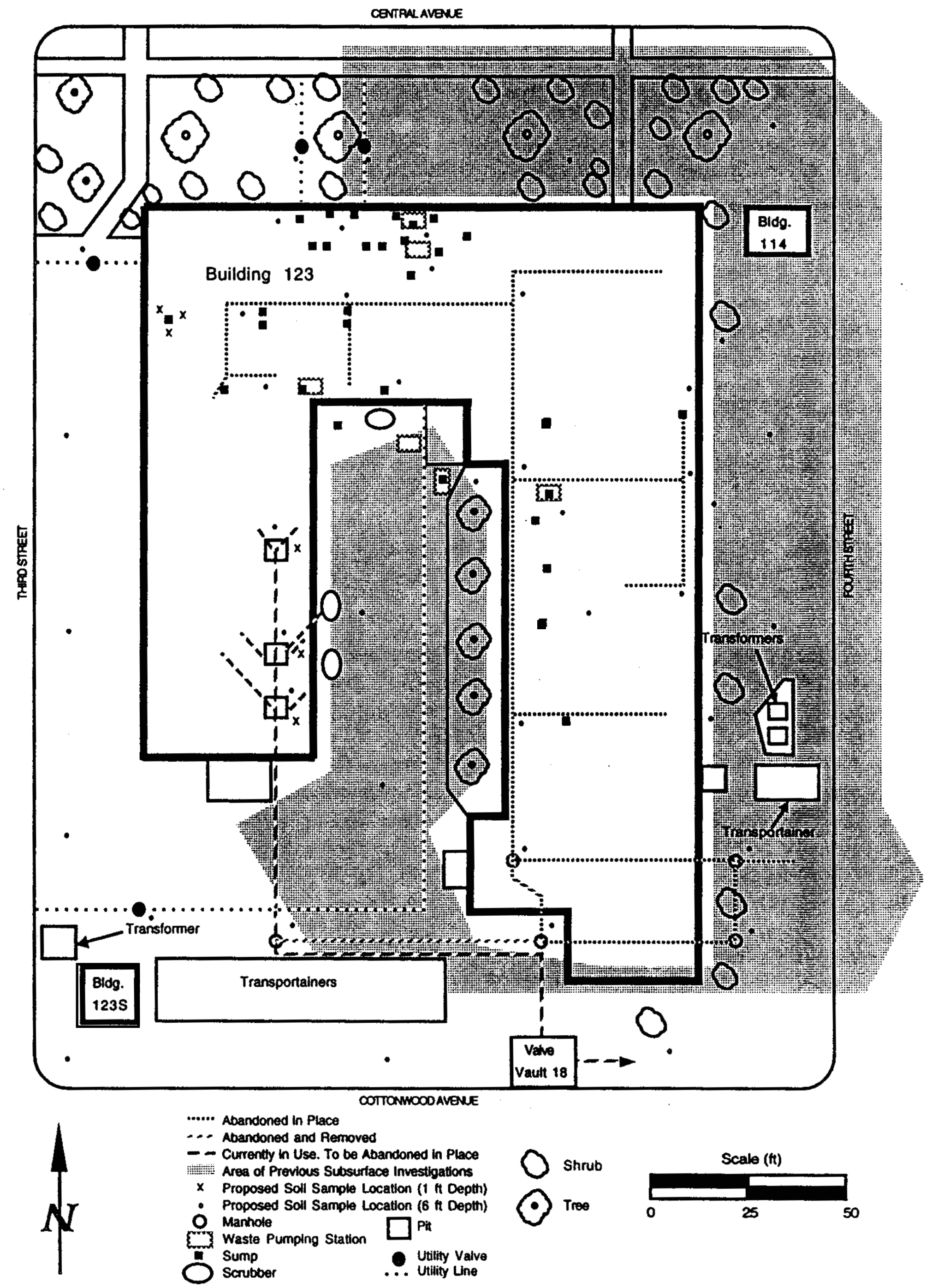

Figure 4.1 Soil Sampling Locations

4.2 Sample Designation

The site standard sample numbering system will be implemented in this project. A simple, unique, alphanumeric location code will be assigned to each sample while in the field. Prior to sample collection, each sample location will be established using tape and compass. Sample locations outside Building 123 will be marked with a reference flag or stake; locations on the building slab will be marked with fluorescent spray paint. Sample numbers will be assigned to the project by the Rocky Flats Environmental Database System (RFEDS) Group. In preparation of the final report, a matrix will be developed to correlate the individual sample numbers to location codes.

4.3 Sample Collection

Sample depths will be reached using a Geoprobe© truck-mounted hydraulic ram in accordance with 5-21000-ER-OPS-GT.39 *Push Subsurface Soil Sampling.* Soil cores will be recovered continuously in two-foot increments using a 1-inch diameter by 24-inch long stainless steel-lined California core barrel. Recovered soil will be placed into a stainless steel bucket until the desired depth is reached, at which time the soil will be composited by hand using a stainless steel trowel. Cores will be monitored with a Flame Ionization Detector (FID) or a Photoionization Detector (PID) in accordance with 5-21000-OPS-FO.15 *Photoionization Detectors and Flame Ionization Detectors.*

Locations beneath the building slab will be sampled by coring through the slab with a hand-held, rotary-type concrete corer to access the underlying soils. Resulting holes will be properly backfilled with granular bentonite.

A Radiological Control Technician (RCT) will scan each sample with a portable Electra scintillation counter. Equipment will also be monitored for radiological contamination during sampling activities. All sampling equipment will be decontaminated with an Alconox solution, and rinsed with deionized water, in accordance with EMD Operating Procedure 5-21000-OPS-FO.03, *General Equipment Decontamination, Section 5.3.1, Cleaning Steel or Metal Sampling Equipment Without Steam in the Field.* All other sampling equipment will include standard items such as chain of custody seals and forms, logbooks, etc. The cores will be visibly inspected for signs of contaminant staining, then visually logged by the field geologist as per 5-21000-ER-OPS-GT.01 *Logging Alluvial and Bedrock Material*. Additional samples will be collected if cores exhibit visible evidence of contamination at shallower depths.

Three (3) field duplicates will be collected to represent at least 5% of the sample batch to provide adequate information on sample variability, as defined in *Guidance for Data Quality Objectives Process* (EPA 1994).

Sample points will be surveyed for location and elevation using Global Positioning System (GPS) equipment to ensure accuracy in data plotting.

Health and safety requirements will be specified in an addendum to the *Building 123 Decommissioning Project Health and Safety Plan* (RF/RMRS-97-022#48). Personal protective equipment (PPE) and air monitoring requirements, and hazard assessments not otherwise defined in the Building 123 PAM will be addressed in the addendum.

4.4 Sample Handling and Analysis

Samples will be handled according to *Environmental Management Department Operating Procedures Volume/ Field Operations*, OPS-FO.13, *Containerization, Preserving, Handling, and*

Shipping of Soil and Water Samples, Volume 1, and OPS-FO.10, *Receiving, Labeling, and Handling of Environmental Containers.*

Table 4.4 indicates analytical requirements. Samples will be submitted to an offsite, EPA-approved laboratory for analysis under a 30-day result turnaround time.

Table 4.4 Analytical Requirements for Soil Samples

Analysis	EPA Method	Container	Preservation	Holding Time
Target Analyte List (TAL) Metals	EPA 6010	1 (one) 250 ml wide-mouth glass jar	Cool, 4°C	180 Days
Target Compound List (TCL) Volatiles	EPA 8260A	2 (two) 125 ml wide-mouth glass teflon-lined jar	Cool, 4°C	7 days
TCL Semi-Volatiles	EPA 8270B	1 (one) 250 ml wide-mouth teflon-lined jar	Cool, 4°C	7 days until extraction, 40 days after extraction
TCL PCBs	EPA 8080A-8081	1 (one) 250 ml wide-mouth teflon-lined jar	Cool, 4°C	7 days until extraction, 40 days after extraction
Total Organic Carbon (TOC)	EPA 415.1	1 (one) 250 ml wide-mouth teflon-lined jar	Cool, 4°C	7 days until extraction, 40 days after extraction
Nitrates	EPA 300 Methods	1 (one) 250 ml glass jar	Cool, 4°C	2 days
Gross Alpha/Gross Beta	EPA 9310	1 (one) 100 ml glass jar	Cool, 4°C	180 days
Isotopics (U233/234, U235, U238, Am241, Pu239/240)	NA[a]	1 (one) 250 ml glass jar	None	180 days

[a] No EPA-approved method is currently in place for isotopics analysis. However, guidance is provided in procedures defined in Environmental Monitoring Support Laboratory (EMSL)-LV 0539-17, *Radiological and Chemical Analytical Procedures for Analysis of Environmental Samples*, March 1979.

5.0 DATA MANAGEMENT

A project field logbook will be created and maintained by the project manager or designee in accordance with 2-S47-ER-ADM-05.15 *Use of Field Logbooks and Forms.* The logbook will include time and date of all field activities, sketch maps of sample locations, or any additional information not specifically required by the SAP. The originator will legibly sign and date each completed original hard copy of data. A peer reviewer will examine each completed original hard copy of data. Any modifications will be indicated in ink, and initialed and dated by the reviewer.

Data for this project will be collected, entered, and stored in a secure, controlled, and retrievable environment in accordance with 2-G18-ER-ADM-17.01 *Records Capture and Transmittal.* Results will be compiled into a sampling and analysis report. Location and analytical data will be entered into and stored in the Geographical Information System (GIS) files.

6.0 QUALITY ASSURANCE

Analytical data collected in support of this investigation will be evaluated using the guidance established by 2-G32-ER-ADM-08.02 *Evaluation of ERM Data for Usability in Final Reports.* This procedure establishes the guidelines for evaluating analytical data with respect to precision, accuracy, representativeness, completeness, and comparability (PARCC) parameters. For precision, the typical relative percent difference been samples and duplicates is less than or equal to 40% for soil. Duplicates comprise at least 5% of the total sample batch. Accuracy is the responsibility of the laboratory. Comparability will be evaluated by comparing historical data with data collected during this event and will be followed in accordance to EPA regulations and Waste Acceptance Criteria, through which data will be validated. Completeness (90% of valid data) will be evaluated by comparing the SAP to the actual sampling episode.

7.0 SCHEDULE

Sample collection and analyses will be conducted in two phases. Phase I will involve collection of twenty-four (24) samples outside of Building 123, and one (1) field duplicate; Phase II will involve collection of twenty-six (26) samples within and beneath the Building 123 slab, and two (2) field duplicates. Phase I samples will be collected at least six (6) weeks before scheduled demolition of Building 123, to allow for turnaround of sample results and data review. Phase I sample results may warrant changes in Phase II sample location and frequency, at which time the SAP will be amended to accommodate such changes.

8.0 ADDITIONAL ACTIVITIES

8.1 Closure of RCRA Unit 40

The Building 123 slab will remain in place following completion of demolition activities. Proper closure of underground, active lines will be contingent upon rinsate and soil sampling analyses results for constituents listed in Table 4.4. In the event that no contamination above Tier II action levels (RFCA, Appendix 6) is detected, the lines will be remediated in accordance with the Closure Plan. All surface openings to active lines will be capped with a plug of non-shrinking bentonite slurry, and the lines will be abandoned in place under the RCRA Unit 40 Closure Plan. Such an action will be considered a RCRA stable configuration in accordance with the Site Part B Operating Permit.

8.2 IHSS Remediation

8.2.1 Soil Remediation

The extent of subsurface contamination will dictate the method of remediation. Areas in which soil sample results meet Tier II criteria will require no further action. Areas that exhibit radioactive or chemical contamination at levels in excess of RCRA regulatory levels will be excavated using conventional techniques and managed as RCRA waste. At the completion of excavation activities, verification samples will be collected along the base and sides of the excavation(s) to determine post action condition of the subsurface soils. Samples will be analyzed according to the SAP. If analytical results indicate that contamination is present above Tier II Action Levels, further excavation and sampling will continue until the Tier II criteria are met.

8.2.2 OPWL Remediation

Abandoned OPWLs will be managed according to analyses results from soil samples collected adjacent to and beneath the lines. Any indication of soil contamination as a consequence of leaking underground lines will eventuate proper removal and disposal of the lines. Lines P-2 and P-3 and portions of P-1 were properly abandoned in 1982 and are not regulated under RCRA. If Phase II sample results indicate that the OPWLs are a source of subsurface contamination, the slab and all underground piping associated with Building 123 will be removed and treated as contaminated waste. Additional sampling may be required to further characterize potentially contaminated areas.

8.3 Disposition of Waste

Remediation and closure activities may generate a combination of radioactive, hazardous and mixed wastes. Contaminated soil and pipeline material are expected to be the major sources of waste. Wastes consisting of plastic, tools, PPE, and other materials associated with remediation will also be a major source of waste. Following remediation activities, the RFETS Building Radiation Cleanup Standard (BRCS) will be utilized to determine if residual radioactive constituents contained in remaining equipment and remediation debris is compliant with RFCA guidelines and appropriate as-low-as-reasonably-achievable (ALARA) considerations. The BRCS is currently under development in coordination with the EPA, CDPHE, and DOE. Until the BRCS is approved, more conservative criteria defined in DOE Order 5400.5 and associated RFETS radiation protection procedures will be used to manage debris generated by remedial activities. Contaminated waste will be handled by qualified waste packaging technicians who will support decontamination specialists and radiation control technicians to identify and segregate hazardous or low level waste. Drums or boxes will be provided by the Waste Disposal group. Waste packaging technicians will package and label the waste and arrange for radioactive waste to be certified by the Waste Certification group. The Project Waste Coordinator will work with the certification personnel and prepare all required documentation. Liquid waste generated during decontamination of sampling and associated equipment will be collected in drums and shipped to Building 374 for processing. Solid waste will be managed by the Waste Disposal group and moved to a temporary staging area immediately adjacent to the site to be placed in rolloff containers until proper disposition is determined. Contaminated soil and pipeline material will ultimately be disposed offsite as RCRA hazardous waste.

9.0 REFERENCES

DOE 1992a, *Final Phase I RFI/RI Work Plan for Operable Unit 9, Original Process Waste Lines*, March.

DOE 1992b, *Final Phase I RFI/RI Work Plan for Operable Unit 13, 100 Area*, October.

DOE 1992c, *Historical Release Report for the Rocky Flats Plant*, Rocky Flats Plant, Golden, CO.

DOE 1993, *Background Geochemical Characterization Report*, September.

DOE 1994, *Final Phase I RFI/RI Work Plan for Operable Unit 9, Technical Memorandum No.1, Volume IIA-Pipelines*, November.

DOE 1996, *Rocky Flats Cleanup Agreement, Final*, July.

EPA 1994, *Guidance for Data Quality Objectives Process*, EPA QA/G-4, September.
RMRS 1997a, *Proposed Action Memorandum for the Decommissioning of Building 123*, May.

RMRS 1997b, *RMRS Quality Assurance Program Description, RMRS-QAPD-001, Rev. 1*, January.

RMRS 1997c, *Final Sampling and Analysis Plan for the Pre-Remedial Investigation of the Mound Site Plume*, February.

ATTACHMENT A

K-H INTEROFFICE MEMORANDUM

Review of Statistical Adequacy of Draft Soil Sampling and Analysis Plan to Support Building 123 D&D, 6-19-97

KAISER • HILL
COMPANY

INTEROFFICE MEMORANDUM

DATE: June 19, 1997

TO: Kirk K. Hilbelink, RMRS Engineering Const. and Decomm., T130F, x6232

FROM: TRG Thomas R. Gatliffe, Statistical Applications Engineering, Bldg130, x6548

SUBJECT: REVIEW OF STATISTICAL ADEQUACY OF DRAFT SOIL SAMPLING AND ANALYSIS PLAN TO SUPPORT BUILDING 123 D&D - TRG-015-97

Per your request of June 12, 1997, I have reviewed the document entitled *Soil Sampling and Analysis Plan To Characterize Integrated Hazardous Substance Sites (IHSS) 121 and 148 at Building 123 (Draft)* dated June 1997 with the objective of assessing the adequacy of the proposed sampling locations and sample size. Based upon the background information provided and the historical results of earlier characterization efforts for IHSS 148, it is my considered professional judgement that the proposed sampling locations and frequency should be adequate to characterize the subsurface soils in the vicinity of and under the Building 123 slab in the absence of isolated areas of significantly elevated levels of contamination ("hot spots"). If one or more hot spots are detected in the initial sampling, additional sampling in the vicinity of the detected hot spot(s) will be required to assess the extent of the significantly contaminated area, the degree and nature of contamination, and the magnitude of clean-up effort required.

With respect to the potential existence of hot spots, likely locations would be in the vicinity of sumps and points of redirection of underground process waste lines (PWL). The existence of hot spots elsewhere is unlikely based upon the historical information and the results of earlier characterization efforts for IHSS 148. The probability of detection of a hot spot is a function of its expected planar size and shape and the likelihood that a sample location falls within the hot spot footprint. (R. O. Gilbert, 1987, *Statistical Methods for Environmental Pollution Monitoring*, Van Nostrand Reinhold, provides more detailed discussion on this subject.) Since all of the likely hot spot locations are beneath the building slab and unlikely to be affected by leaching by rainwater, a generally circular diffusion pattern and downward infiltration path can be assumed.

Based upon the locations shown in Figure 4.1 of the proposed sampling plan and assuming they are plotted to scale, it is estimated that any hot spot with a radius of fifteen feet or greater would by detected with approximately ninety-five percent probability. Any hot spot emanating from a sump with a radius of twelve-feet or more or emanating from a PWL point of redirection with a radius of six feet or more would be detected with approximately eighty percent probability. If hot spots of smaller size are anticipated, high detection probabilities can only be achieved by increasing the number of samples and fixing their locations closer to the more isolated potential hot spots.

If you have questions or desire further information concerning the material provided in this letter or if I may be of further assistance with regard to this or any other matter, please do not hesitate to contact me at your convenience.

cc:
E.G. Nuccio, Engineering Support Services